University of Bahrain
College of Information Technology
Department of Computer Science

ITCS252 Discrete Mathematics

First Semester 2011/2012
Second Midterm Exam — 60 minutes.

Time: 2:30 – 3:30 PM

STUDENT NAME	
STUDENT#	
SECTION	

QUESTION#	MARKS		COMMENTS
1	8		
2	10		
3	8		
4	9		
5	10		
TOTAL	45		

Instructor: Dr. Ali Alsaffar
Dr. Rakesh Singh

Answer All Questions

Q1. **[8 points]** If $n^2 + 2$ is odd, then $n + 1$ is not odd.

Q2. (a) **[4 points]** Determine all of the elements in each of the following sets.

(1) $\{1 + (-1)^n \mid n \in \mathbb{Z}\} =$

(2) $\{x \in \mathbb{R} \mid x^2 + 4x + 3 = 0\} =$

(b) **[6 points]** Let $A_n = \{n + 1, n + 2, n + 3, \cdots\}$. Find

(1) $A_n \cup A_{n+1} =$

(2) $A_n \cap A_{n+1} =$

(3) $| A_n \cap \mathcal{P}(A_n) | \quad =$

Q3. [**8 points**] For any sets A, B, and C, prove that the sets $(A \cap B) - C$ and $(A \cap C) - B$ are disjoints.

Q4. [**9 points**] Let $a, b, c \in \mathbb{Z}$ and $c \neq 0$. Prove that if c divides $(ca + b)$, the c divides b.

Q5. **[10 points]** Prove that

$$\frac{2}{3} + \frac{2}{3^2} + \cdots + \frac{2}{3^n} = 1 - \left(\frac{1}{3}\right)^n, \quad n \geq 1$$